



Re

3410 Pest Detection

Date: NOV 21 1984

Subject: Western Spruce Budworm Impact Survey of Red River Canyon

To: Forest Supervisor, Carson NF

During October 1984, Forest Pest Management personnel conducted a survey to assess the western spruce budworm (WSBW) impact in Red River Canyon, Questa Ranger District, Carson National Forest. The objectives of this survey were to: (1) Quantify WSBW impact on forested areas within Red River Canyon, and (2) produce a map showing location of major impacts.

The survey area encompassed approximately 35,000 acres of the Red River drainage from Questa east to Red River Pass (figure 1). Large-scale (1:5,000), infrared aerial photography was taken in mid-September 1984 and obtained through a private contract issued by Engineering, Regional Office. This photography, covering 100 percent of the survey area, was subdivided into cells (roughly 13 acres in size), and classified into one of the following impact classifications by experienced photointerpreters:

1. Nonhost. Nonforested or more than 50 percent nonhost tree species.
2. No Impact. No defoliation; no mortality.
3. Light to Moderate Impact. Light to heavy defoliation; less than 10 percent mortality.
4. Heavy Impact. Heavy defoliation; less than 50 percent mortality.
5. Dead. More than 50 percent mortality.

Forty-one of these subcells were selected and visited for ground truth acquisition--11 each in the no impact and light to moderate impact strata, 12 in the heavy impact stratum, and 7 in the dead stratum. No ground data were obtained from the nonhost stratum. Ground truth data were collected from 5 plots established within each of these 41 subcells. Plots consisted of a 10-BAF variable point sample and a 1/300-acre fixed plot. All trees larger than 5 inches in diameter (d.b.h.) were recorded on the variable point samples. All trees taller than 3 inches, but less than 5 inches d.b.h., were recorded on the fixed plots. Tree diameters were measured to the nearest tenth of an inch. Tree heights were measured to the nearest foot on 25 percent of the trees tallied on the variable point samples.

Budworm impacts were recorded on all tallied trees as follows: No defoliation; moderate defoliation (less than 50 percent of the crown defoliated by WSBW); heavy defoliation (50 percent or more of the crown defoliated by WSBW); or mortality caused, at least in part, by repeated defoliation during the current



WSBW outbreak. No attempt was made to quantify top-kill. Identifiable bark beetle impacts and mortality caused by unknown factors were also recorded on all tallied trees. Other pest problems, such as heavy dwarf mistletoe infections and root diseases, were noted, but not included in the data analysis.

Preliminary results showing WSBW impacts by stratum are presented in table 1. These results show impacts ranged from no visible defoliation to light and moderate defoliation over approximately 18,600 acres of mixed conifer host type within the Red River drainage in 1984. More severe defoliation and some measurable mortality, related to WSBW defoliation, occurred over an additional 9,300 acres of highly susceptible stands which are comprised predominantly of Douglas-fir and white fir. Within these highly susceptible stands, between 4 and 19 percent of the trees were apparently killed by repeated WSBW defoliation, 3 to 6 percent of the trees were killed by unknown factors, and 3 to 26 percent of the host trees showed no impact.

Widely scattered mortality, caused by a variety of bark beetles (western balsam bark beetle in subalpine fir, spruce beetle in Engelmann spruce, and Douglas-fir beetle in Douglas-fir), was recorded throughout the survey area, but at the present low level is insignificant. Within the dead stratum, 1 percent of the trees (three trees per acre) have been killed by Douglas-fir beetle in the last 2 years. This type of mortality, which generally occurs in groups of 10 or more trees all fading at the same time, is highly visible and often appears to be more widespread than actual surveys indicate. While these beetles are killing some scattered groups of stressed and weakened trees within Red River Canyon, we anticipate no major outbreak.

Heavy Douglas-fir dwarf mistletoe infections were noted in many areas of the heavy and dead strata. These infections are also stressing the host Douglas-fir and causing additional impact within Red River Canyon.

A summary of preliminary results by stratum follows:

Nonhost. The nonhost stratum consisted of 7,100 acres, representing 20.3 percent of the survey area. These acres were either nonforested or forested, predominantly with nonhost trees, including oak, pines, or juniper.

No Impact/Light to Moderate Impact. Because of similarities in stand structure and WSBW impacts, the no impact and light to moderate impact strata have been combined for this discussion. The no impact stratum and the light to moderate impact stratum comprised 8,100 acres (23.2 percent) and 10,500 acres (30.1 percent) of the survey area, respectively. Stands within these two strata consisted generally of a balanced mixture of Douglas-fir, subalpine fir, Engelmann spruce, and aspen. Other conifers, including white fir, southwestern white pine, ponderosa pine, pinyon pine, and juniper, were present, but a minor component of these stands.

Light to moderate defoliation occurred throughout these two strata; heavy defoliation was minimal; and WSBW-related mortality absent. Approximately 94 percent of the trees in the no impact stratum and 55 percent of the trees within the light to moderate impact stratum showed no impact.

Bark beetle activity (western balsam bark beetle in subalpine fir and spruce beetle in Engelmann spruce) was recorded, but at normal, low levels (less than one tree per acre), posing no threat. Douglas-fir dwarf mistletoe was generally absent or at low levels.

Heavy Impact. The heavy impact stratum covered 9,000 acres, representing 25.6 percent of the survey area. Stands within this stratum were comprised almost entirely (about 80 percent) of Douglas-fir and white fir; therefore, highly susceptible to WSBW outbreaks and vulnerable to severe impacts.

WSBW impacts consisted of heavy defoliation and significant mortality. Of the trees less than 5 inches d.b.h., 24 percent showed no impact (6 percent host species and 18 percent nonhost species), 28 percent were moderately defoliated, 39 percent were heavily defoliated, and 8 percent were apparently killed by repeated defoliation. Of those trees 5 inches d.b.h. and greater, 13 percent showed no impact (2 percent host species and 11 percent nonhost species), 19 percent were moderately defoliated, 61 percent were heavily defoliated, and 4 percent were apparently killed by repeated defoliation.

Mortality caused by Douglas-fir beetle was recorded, but at a low level (less than one tree per acre). Heavy Douglas-fir dwarf mistletoe infections were noted in about one-third of the areas surveyed.

Dead. Only 300 acres (less than 1 percent) of the survey area were classified into this stratum. All of these areas, located between the Columbine drainage and Largo Canyon, have limited access and are not visible from Highway 38 in Red River Canyon. Douglas-fir and white fir comprised about 90 percent of the trees within this stratum. Variation within the damage categories of the trees less than 5 inches d.b.h. was high; therefore, the following impacts should be considered in general terms rather than statistically reliable: 34 percent showed no impact (26 percent host species and 8 percent nonhost species), 51 percent were moderately defoliated, 9 percent were heavily defoliated, and 4 percent were apparently killed by repeated WSBW defoliation. An additional 3 percent were killed by unknown causes.

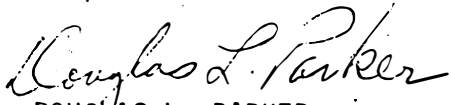
Of the trees 5 inches d.b.h. and larger, 17 percent showed no impact (3 percent host species and 14 percent nonhost species), 7 percent were moderately defoliated, 51 percent were heavily defoliated, and 19 percent were apparently killed by repeated WSBW defoliation. An additional 6 percent were killed by unknown causes.

Mortality caused by Douglas-fir beetle represented 1 percent (three trees per acre). Heavy Douglas-fir dwarf mistletoe infections were noted on over one-half of the areas surveyed.

In summary, within the 18,600 acres of combined no impact/light to moderate impact strata, most trees show either no impact or light to moderate defoliation. Because of the "less susceptible" mixed species composition of most stands within these strata, we expect impacts will remain limited to light and moderate defoliation. Some top-killing and mortality could occur in the smaller size classes, particularly if repeated defoliation continues over the next few years.

Within the 9,300 acres of combined heavy impact and dead strata, severe defoliation and some mortality have occurred and will continue to occur as long as the current infestation persists. However, not all host trees are or will be severely impacted, and overall visual quality within these strata will recover following collapse of the infestation.

A map showing stratified areas of impact will be sent to you as soon as it is completed.



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Director of Forest Pest Management

Enclosures (2)

Figure 1

Table 1

cc:

RF (w/encls.)

S&PF (w/encls.)

RES (w/encls.)

TM (w/encls.)

LMP (w/encls.)

WO (w/encls.)

Santa Fe NF (w/encls.)

Cibola NF (w/encls.)

Lincoln NF (w/encls.)

Rn (w/encls.)

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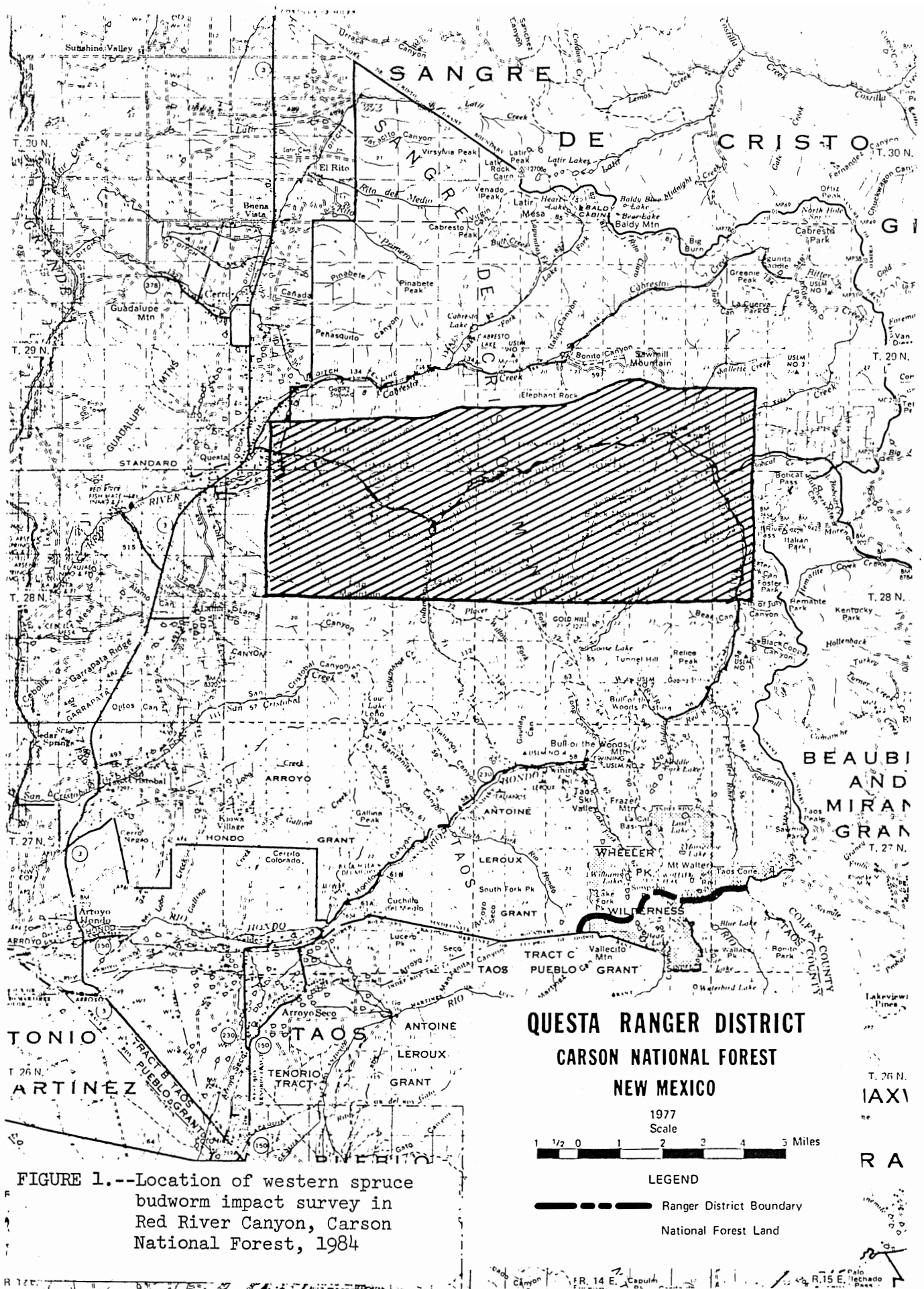


TABLE 1.--Results of Western spruce budworm impact in Red River Canyon, Carson National Forest 84

			Western spruce budworm impacts																Bark beetle mortality				Other unknown mortality (all tree species)			
			No defoliation				Less than 50 percent defoliation				50 percent + defoliation				Mortality											
			T/A ²	BA ³	CF/A ⁴	BF/A ⁵	T/A	BA	CF/A	BF/A	T/A	BA	CF/A	BF/A	T/A	BA	CF/A	BF/A	T/A	BA	CF/A	BF/A	T/A	BA	CF/A	BF/A
Nonhost ¹	7,100																									
No Impact	8,100	<5" d.b.h.	1,762	21	0	0	44	1	0	0	11	0	0	0	0	0	0	0	0	0	0	0	60	1	0	0
		5" + d.b.h.	191	85	1,788	5,948	7	4	82	325	4	2	19	0	0	0	0	0	<1	<1	4	13	3	1	25	49
(western balsam bark beetle in subalpine fir)																										
Light to moderate impact	10,500	<5" d.b.h.	1,190	5	0	0	682	4	0	0	213	3	0	0	0	0	0	0	0	0	0	55	<1	0	0	
		5" + d.b.h.	130	55	1,084	2,439	79	49	1,025	2,963	20	13	264	723	0	0	0	0	<1	<1	4	17	12	5	104	178
(spruce beetle)																										
Heavy impact	9,000	<5" d.b.h.	25 host 75 nonhost	<1	0	0	120	1	0	0	165	4	0	0	35	2	0	0	0	0	0	5	<1	0	0	
		5" + d.b.h.	3 host 18 nonhost	16	311	1,024	30	25	495	1,698	96	47	848	2,069	7	1	27	15	<1	<1	4	20	4	2	41	121
(Douglas-fir beetle)																										
Dead	300	<5" d.b.h.	1,269 host 385 nonhost	3	0	0	2,486	<1	0	0	463	8	0	0	180	6	0	0	0	0	0	137	3	0	0	
		5" + d.b.h.	7.5 host 13.5 nonhost	13	239	434	19	18	388	1,453	136	61	1,113	2,647	51	16	260	233	3	4	74	301	15	7	115	244
(Douglas-fir beetle)																										

¹No ground data were obtained from the nonhost stratum.²T/A = Trees per acre.³BA = Basal area.⁴CF/A = Volume in cubic feet per acre.⁵BF/A = Volume in board feet per acre.